RECEIVED

AUG 0 8 2001

TECH CENTER 1600/2900

SEQUENCE LISTING

<110> Archer, John AC
      Summers, David K
      Roland, Hervé J
      Powell, Justin AC

<120> Biosensor materials and methods

<130> 0380-P02083-US0

<140> US 09/446,681
<141> 2000-03-14

<150> PCT/GB98/01893
<151> 1998-06-29

<150> GB 9713666.7
<151> 1997-06-27

<160> 12

<170> PatentIn Ver. 2.1

<210> 1
<211> 7584
<212> DNA
<213> Rhodococcus corallina

<400> 1
```
gaattccatg ttcttctcct tgcatgtggc ccgcgttgcc gagggcactg ctcggcctgt 60
cgcccgcaga gggcgcatgt ccgggtgcct ggatatggcg cgtacggcgt gccctccggc 120
gttaaccccg aggttggcca cgatgccccg gccatcaggt ctggaatgct agcgttccag 180
acgaaggtaa cccacagtga ctcacaccac aagtactaga atgcaagctg ttgcggtgag 240
cgccgcggca taaggggag ccatgtccgg gacgccgacg gaaagcctga ctcgatgacc 300
accaccgaca ccggccccaa gccgggcagt gaggccgccg ccctgctcgc caatgtccgc 360
acctcggggg cgcggctgtc ctccgcgttg tacgacattc tgaagaaccg gctgctcgaa 420
gggcgctatg cggcaggcga gaagatcgtc gtcgagtcga tccggcaaga gttcggggtg 480
agcaagcagc ccgtcatgga cgctctgcgc cgcctgtcca gcgacaagct ggtccacatc 540
gttccccagg tcggttgcga ggtcgtctcc tacgccccgc gcgaagtgga agacttctac 600
accctgttcg gcggtttcga agggaccatc gccgcggtag cggcctcccg gcggaccgag 660
gcccagttgc tggagctgga cctgatctcg cgcgcgggtcg acgccctgat cacctcccac 720
gacccggtgg tccgcgcccg cgggtaccgc gtgcacaacc gggagttcca tgcggccatc 780
cacgcgatgg cgcactcgcg gatcatggag gagaccagcc agcgaatgtg ggatctgtcg 840
gacttcttga tcaacaccac cggcatcacc aacccgctct cgagcgcact gcccgaccgg 900
cagcatgacc accacgaaat caccgaggcc atccgcaacc gtgacgcagc tgccgcccgc 960
gaggccatgg aacgccacat cgtcggcacc atcgcagtaa tccgcgacga tccaacgcc 1020
cagctgccga gctagacccc gatacccggg ccatcgaccg gctccgctat cgcgccacct 1080
acgccgaggg gggactctcg gccgtagcgc tgcagacgat ccaccggcac cctccacgct 1140
gaccctgtc tcgccctaga gggccggcgc gccgtcgatc acctttaccc tcatccagag 1200
acttgcgtca ccctctatgc ccgagtagcg tctgaactag acgtctagca ttctagttga 1260
gtgctccctc tcgaagattc tccagagaac ccctctcgaa catccccaga agaaaggagc 1320
ggccatgacg accgcttcgc acgcatcgtc cttcggggca cgagcccact tccgcccaca 1380
gatcggggaa gcccgaccgt gagcaccaca cctacctccc gacgaagac ctcaccgctg 1440
cgggtagcga tggccagctt catcggtacc accgtcgagt actacgactt cttcatctac 1500
ggcaccgcgg ccgcgctggt attccctgag ttgttcttcc cggatgtctc gtccgcgatc 1560
```

```
ggaatcctgt tgtcgttcgc gaccttcagc gttgggttcc tcgcccgccc gctgggtggc 1620
atagtgttcg ggcacttcgg tgaccgggtc ggccgcaagc agatgctggt gatctccctg 1680
gtcggaatgg gctcggccac cgtactgatg ggattgttgc ccggttacgc ccaaatcggg 1740
atcgccgccc ccatcctgct gaccctgctg cgcctggtgc agggctttgc cgtcggcggc 1800
gagtgggggtg gagccaccct gatggccgtc gagcacgccc ccaccgcgaa gaagggcttt 1860
ttcggatcct tctcccagat gggggcaccc gccgggacca gcgtcgcaac cctggcgttc 1920
ttcgcggtct cccaattgcc cgacgagcag ttcctgagtt ggggctggcg actgccgttc 1980
ctgttcagcg cggtgctgat cgtgatcggg ctgttcattc gcctgtccct ggccgaaagc 2040
cccgacttcg ccgaggtgaa ggcacagagc gccgtggtgc gaatgccgat cgccgaagcg 2100
ttccgcaagc actggaagga aattctcctc atcgcgggca cctacctgtc caaggagtg 2160
ttcgcctata tctgcatggc ctacctcgtc tcctacggca ccaccgtcgc ggggatcagc 2220
cgcaccttcg ccctggccgg agtattcgtc gccggcatcg tcgccgtcct cctctacctc 2280
gtgttcggcg ctctgtccga cactttcggc cgcaagacca tgtacctgct cggcgccgcc 2340
gcgatgggtg tggtgatcgc ccccgccttc gcactgatca acaccggcaa cccgtggctg 2400
ttcatggccg cgcaggtgct ggtcttcgga attgcaatgg ccccccgccgc cggcgtgaca 2460
ggctccctgt tcacgatggt cttcgacgcg gacgtgcgct acagcggtgt ctctatcggc 2520
tacaccatct cccaggtcgc cggctccgcg ttcgccccga cgatcgcgac cgccttgtac 2580
gcctccacca acaccagcaa ctcgatcgtg acctacctgc tgatcgtctc ggccatctcg 2640
atcgtctcgg tgatcctgct gcccggcggc tgggggcgca agggcgctgc gagccagctc 2700
actcgcgacc aggccacctc cacaccgaaa atgcctgaca ccgaaacatt ttcgactcgg 2760
acagttccgg acaccgcagc atccctgcgc gtcctcgaca agtgaagtga tgacagacat 2820
gagtgaccac gaccgcacct cctacgacac cgacgtcgtg atcgtcggcc tcggccccgc 2880
cggtggcaca gcggcgcttg ccctggccag ctacggcatc cgcgttcacg ccgtctcgat 2940
gttccctgg gtggcgaact cgccgcgcgc gcacatcacc aaccagcgcg ccgtcgaagt 3000
gctgcgtgac ctgggcgtcg aagacgaggc gcgcaactac gccacccgt gggaccagat 3060
gggcgacacg ctgttcacca cgagcctggc cggcgaggag atcgtccgga tgcagacctg 3120
gggtacgggc gatatccgct acggggacta cctgtccgga agccctgca cgatgctcga 3180
cattccgcag cccctgatgg agccggtgct gatcaagaac gccgccgaac gtggtgcggt 3240
catcagcttc aacaccgaat acctcgacca cgcccaggac gaggacgggg tgaccgtccg 3300
gttccgcgac gtccgctcgg gcaccgtgtt cacccagcga gcccgcttcc tgctcggttt 3360
cgacggcgca cgatcgaaga tcgccgaaca gatcgggctt ccgttcgaag gtgaactcgc 3420
ccgcgccggt accgcgtaca tcctgttcaa cgcgggacctg agcaaatatg tcgctcatcg 3480
gccgagcatc ttgcactgga tcgtcaactc gaaggccggt ttcggtgaga tcggcatggg 3540
tctgctgcgc gcgatccgac cgtgggacca gtggatcgcc ggctggggct tcgacatggc 3600
gaacggcgag ccggatgtct ccgacgacgt tgtcctcgaa cagatccgga ccctcgtcgg 3660
cgacccgcac ctggacgtcg agatcgtgtc gaggtccttc tggtacgtca accggcagtg 3720
ggctgagcac taccagtccg gtcgagtgtt ctgcggcggc gacgcggtgc accggcatcc 3780
gccgagcagc gggctgggct cgaacacgtc catgcaggac gcgttcaacc tggcatggaa 3840
gatcgcgttc gtcgtgaagg ggtatgcagg accgggtctg ctcgagtcct actctcctga 3900
gcgtgttccg gtcggcaaac agatcgtcgc tcgcgccaac cagtcccgca aggactacgc 3960
cgggctgcgc gaatggttcg atcacgagag cgacgacccg gtcgccgccg gcctggcaaa 4020
gttgaaggaa ccctcgtccg aaggtgttgc tctgcgtgag cggctgtacg aggcgctgga 4080
ggtgaagaac gccgaattca acgcccaggg cgtcgaactc aaccagcgct acacctcgtc 4140
cgcggtcgtt cccgaccccg aggcgggcga ggaagtgtgg gtgcgcgatc gtgagctgta 4200
cctgcaggcc accacccggc cgggcgcgaa gctgccgcat gcgtggctgg tcggcgccga 4260
cggaacccgc atctccaccc tcgacgtcac cggcaaggga atgatgaccc tgctgaccgg 4320
actcggcggc caggcatgga agcgtgccgc cgccaaactc gacctgccgt tcctgcggac 4380
cgtcgttgtc ggcgaacccg gcaccatcga cccttacgga tactggcggc gggtccgcga 4440
catcgacgag gccggcgccc tgctcgtgcg gcccgacggc tacgtcgcgt ggcgacacag 4500
tgctccggtc tgggacgaca ccgaagcgct caccagcctc gagaacgctc tcaccgcggt 4560
cctcgaccac tcggccagcg acaacgggaa cccgagcggc acaaacgagc cgcagtacag 4620
cacccgggcc gtgccgatcg tcgttccgca cgttaccgcc gaggatgcag caccagcttc 4680
cgccacccgc accaccacag tcgagggaga gaaccgatga cccgtcctta caccagcgtc 4740
tgggacgacc tgaaccaggt cgagttcagc caggattca tccaggccgg ccctaccgg 4800
acccgatacc tgcacgccgg cgattcgtcc aagcccacgc tgatcctgct gcacggcatc 4860
accggccacg ccgaggcgta cgtgcgcaat ctgcgctcgc attccgagca cttcaacgtc 4920
tgggcaatcg acttcatcgg ccacggctat tcgaccaagc ccgaccaccc gctcgagatc 4980
```

```
aagcactaca tcgaccacgt gctgcagttg ctggacgcca tcggcgtcga gaaggcctcg 5040
ttttccgggg agtctctcgg cggttgggtc accgcccagt tcgcgcacga ccatcccgag 5100
aaggtcgacc ggatcgtgct caacaccatg ggcggcacca tggccaaccc tcaggtgatg 5160
gaacgtctct ataccctgtc gatggaagcg gcgaaggacc cgagctggga acgcgtcaaa 5220
gcacgcctcg aatggctcat ggccgacccg accatggtca ccgacgacct gatccgcacc 5280
cgccaggcca tcttccagca gccggattgg ctcaaggcct gcgagatgaa catggcactg 5340
caggacctcg aaacccgcaa gcggaacatg atcaccgacg ccactctcaa cggcatcacg 5400
gtgcccgcga tggtgctgtg gaccaccaag gacccctccg gtccggtcga cgaagccaag 5460
cgcatcgcct cccacatccc gggcgccaag ctggccatca tggagaactg tggccactgg 5520
ccccagtacg aggaccccga gaccttcaac aagctgcatc tggacttcct cctcggtcgc 5580
agctgacaca gaccccggcc ggtgccgcca acccctgcaa cccgggcggc accggccgga 5640
tctcacttac ccgacctatt gcgctctcgt ccggaccccc ggagagaaag cgccgaagca 5700
gcagcaagga gaccgccgcg atgcctgtag cgctgtgcgc gatgtcgcac tcccccctga 5760
tgggacgcaa cgaccccgaa caggaagtca tcgacgccgt cgacgccgca ttcgaccacg 5820
cgcgccggtt cgtcgccgac ttcgcccccg atctcatcgt catcttcgcc cccgaccact 5880
acaacggcgt cttctacgac ctgctgccgc cgttctgtat cggtgccgcc gcgcagtccg 5940
tcggcgacta cggcaccgaa gccggccctc tcgacgtcga ccgtgacgcc gcctacgcag 6000
tcgcccgcga cgtcctcgac agcggcatcg acgtcgcatt ctccgaacgc atgcacgtcg 6060
accacggatt cgcccaagca ctccaattgc tggtcggatc gatcaccgcc gtgccgaccg 6120
tgccgatctt catcaattcg gtcgccgaac cgctcggccc ggtcagccgg gtacggctgc 6180
tcggcgaggc ggtcgggcgg gccgctgcca agctggacaa gcgtgtgctg ttcgtcggat 6240
ccggcggcct gtcccacgac ccgccggtcc cgcagttcgc caccgcgcca gaggaagtgc 6300
gcgagcggtt gatcgacggc cgcaatccca gtgccgccga acgtgatgcc cgcgaacagc 6360
gcgtcatcac cgccgggcgg gacttcgccg ccggcaccgc cgccatccag ccactgaacc 6420
ccgaatggga ccggcacctg ctcgacgtcc tcgcctccgg cgacctcgag cagatcgacg 6480
cgtggaccaa cgactggttc gtcgaacagg ccggacactc ctcccacgaa gtgcgcacct 6540
ggatcgccgc gtacgcggca atgagcgccg ccgggaagta ccgcgtcacc tcgaccttct 6600
accgcgaaat ccacgagtgg atagcaggat tcgggattac taccgccgtc gccgtcgacg 6660
aatagacccc gccgctcccg ccccgcagtc ccaacgaagg gtggccccgg atgacctccg 6720
tccgcccgtg ctcgccgtcg gtgaacgcgg gctggtcggt gggcaggaag acctcatcgc 6780
cgacatcgcc ctcgacctcg cagctcgtca gtaggaatgc gcacgggccg acgagtcgcg 6840
ctggtcaccg gggccagccg cggcatcggg gcggccatcg cagatgcggt ggccgcctcc 6900
ggtgccgccg taatcgtcca ctacggatcc gatcggacgg ccgccgctgc ggtgtcgacg 6960
gcatcacggc tgccgggggc ctcgcggctg cggtccaggc cgacctgtcc cgacccgagg 7020
ggcctgaaga gctgatgcgg gagttcgact ccgcgctcga cggtctcggg ctcgaccgag 7080
ggctcgacat cctcgtcaac aacgccggaa tcagtcggcg cggagcgctc gagcgcgtca 7140
ctgtcgagga tttcgaccgt ctggtcgcac tcaaccagcg cgccccgttc ttcgtgactc 7200
ggcatgccct gccccggatg cacgacggcg gtcgcatcgt caacatttcc tccggatccg 7260
cccgctacgc cagacccgac gtcatcagct acgccatgac caaggggggcg atcgaggtgc 7320
tcacccgcgc cctcgccgta gacgtcggcg aacgaggcat caccgccaac gccgtggcgc 7380
cggccgcgct cgataccgac atgaacgcgc actggcttcg cggtgacgac catgcccgca 7440
ccaccgccgc gtccaccact gcactgcgaa aactcgccac cgcggaggac atcgccgcga 7500
tcgtggcctt cctcgtcagc gccgccgccg gtgcgatcac cgggcaggtc atcgacgcca 7560
ccaacggcaa ccggctctaa ccag                                     7584
```

<210> 2
<211> 7584
<212> DNA
<213> Rhodococcus corallina

<400> 2

```
ctggttagag ccggttgccg ttggtggcgt cgatgacctg cccggtgatc gcaccggcgg 60
cggcgctgac gaggaaggcc acgatcgcgg cgatgtcctc cgcggtggcg agttttcgca 120
gtgcagtggt ggacgcggcg gtggtgcggg catggtcgtc accgcgaagc cagtgcgcgt 180
tcatgtcggt atcgagcgcg gccggcgcca cggcgttggc ggtgatgcct cgttcgccga 240
cgtctacggc gagggcgcgg gtgagcacct cgatcgcccc cttggtcatg gcgtagctga 300
```

```
tgacgtcggg tctggcgtag cgggcggatc cggaggaaat gttgacgatg cgaccgccgt 360
cgtgcatccg gggcagggca tgccgagtca cgaagaacgg ggcgcgctgg ttgagtgcga 420
ccagacggtc gaaatcctcg acagtgacgc gctcgagcgc tccgcgccga ctgattccgg 480
cgttgttgac gaggatgtcg agccctcggt cgagcccgag accgtcgagc gcggagtcga 540
actcccgcat cagctcttca ggcccctcgg gtcgggacag gtcggcctgg accgcagccg 600
cgaggccccc ggcagccgtg atgccgtcga caccgcagcg gcggccgtcc gatcggatcc 660
gtagtggacg attacggcgg caccggaggc ggccaccgca tctgcgatgg ccgccccgat 720
gccgcggctg gccccggtga ccagcgcgac tcgtcggccc gtgcgcattc ctactgacga 780
gctgcgaggt cgagggcgat gtcggcgatg aggtcttcct gcccaccgac cagcccgcgt 840
tcaccgacgg cgagcacggg cggacggagg tcatccgggg ccaccettcg ttgggactgc 900
ggggcgggag cggcggggtc tattcgtcga cggcgacggc ggtagtaatc ccgaatcctg 960
ctatccactc gtggatttcg cggtagaagg tcgaggtgac gcggtacttc ccggcggcgc 1020
tcattgccgc gtacgcggcg atccaggtgc gcacttcgtg ggaggagtgt ccggcctgtt 1080
cgacgaacca gtcgttggtc cacgcgtcga tctgctcgag gtcgccggag gcgaggacgt 1140
cgagcaggtg ccggtcccat tcggggttca gtggctggat ggcggcggtg ccggcggcga 1200
agtcccgccc ggcggtgatg acgcgctgtt cgcgggcatc acgttcggcg gcactgggat 1260
tgcggccgtc gatcaaccgc tcgcgcactt cctctggcgc ggtggcgaac tgcgggaccg 1320
gcgggtcgtg ggacaggccg ccggatccga cgaacagcac acgcttgtcc agcttggcag 1380
cggcccgccc gaccgcctcg ccgagcagcc gtaccggct gaccgggccg agcggttcgg 1440
cgaccgaatt gatgaagatc ggcacggtcg gcacggcggt gatcgatccg accagcaatt 1500
ggagtgcttg ggcgaatccg tggtcgacgt gcatgcgttc ggagaatgcg acgtcgatgc 1560
cgctgtcgag gacgtcgcgg gcgactgcgt aggcggcgtc acggtcgacg tcgagagggc 1620
cggcttcggt gccgtagtcg ccgacggact gcgcggcggc accgatacag aacggcggca 1680
gcaggtcgta gaagacgccg ttgtagtggt cgggggcgaa gatgacgatg agatcggggg 1740
cgaagtcggc gacgaaccgg cgcgcgtggt cgaatgcggc gtcgacggcg tcgatgactt 1800
cctgttcggg gtcgttgcgt cccatcaggg gggagtgcga catcgcgcac agcgctacag 1860
gcatcgcggc ggtctccttg ctgctgcttc ggcgctttct ctccgggggt ccggacgaga 1920
gcgcaatagg tcgggtaagt gagatccggc cggtgccgcc cgggttgcag gggttggcgg 1980
caccggccgg ggtctgtgtc agctgcgacc gaggaggaag tccagatgca gcttgttgaa 2040
ggtctcgggg tcctcgtact ggggccagtg gccacagttc tccatgatgg ccagcttggc 2100
gcccgggatg tgggaggcga tgcgcttggc ttcgtcgacc ggaccggagg ggtccttggt 2160
ggtccacagc accatcgcgg gcaccgtgat gccgttgaga gtggcgtcgg tgatcatgtt 2220
ccgcttgcgg gtttcgaggt cctgcagtgc catgttcatc tcgcaggcct tgagccaatc 2280
cggctgctgg aagatggcct ggcgggtgcg gatcaggtcg tcggtgacca tggtcgggtc 2340
ggccatgagc cattcgaggc gtgctttgac gcgttcccag ctcgggtcct tcgccgcttc 2400
catcgacagg gtatagagac gttccatcac ctgagggttg gccatggtgc cgcccatggt 2460
gttgagcacg atccggtcga ccttctcggg atggtcgtgc gcgaactggg cggtgaccca 2520
accgccgaga gactccccgg aaaacgaggc cttctcgacg ccgatggcgt ccagcaactg 2580
cagcacgtgg tcgatgtagt gcttgatctc gagcgggtgg tcgggcttgg tcgaatagcc 2640
gtggccgatg aagtcgattg cccagacgtt gaagtgctcg gaatgcgagc gcagattgcg 2700
cacgtacgcc tcggcgtggc cggtgatgcc gtgcagcagg atcagcgtgg gcttggacga 2760
atcgccggcg tgcaggtatc gggtccggta ggggccggcc tggatgaatc cctggctgaa 2820
ctcgacctgg ttcaggtcgt cccagacgct ggtgtaagga cgggtcatcg gttctctccc 2880
tcgactgtgg tggtgcgggt ggcggaagct ggtgctgcat cctcggcggt aacgtgcgga 2940
acgacgatcg gcacggcccg ggtgctgtac tgcggctcgt ttgtgccgct cgggttcccg 3000
ttgtcgctgg ccgagtggtc gaggaccgcg gtgagagcgt tctcgaggct ggtgagcgct 3060
tcggtgtcgt cccagaccgg agcactgtgt cgccacgcga cgtagccgtc gggccgcacg 3120
agcagggcgc cggcctcgtc gatgtcgcgg acccgccgcc agtatccgta agggtcgatg 3180
gtgccgggtt cgccgacaac gacggtccgc aggaacggca ggtcgagttt ggcggcggca 3240
cgcttccatg cctggccgcc gagtccggtc agcagggtca tcattccctt gccggtgacg 3300
tcgagggtgg agatgcgggt tccgtcggcg ccgaccagcc acgcatgcgg cagcttcgcg 3360
cccggccggg tggtggcctg caggtacagc tcacgatcgc gcacccacac ttcctcgccc 3420
gcctcggggt cgggaacgac cgcggacgag gtgtagcgct ggttgagttc gacgccctgg 3480
gcgttgaatt cggcgttctt cacctccagc gcctcgtaca gccgctcacg cagagcaaca 3540
ccttcggacg agggttcctt caactttgcc aggccggcgg cgaccgggtc gtcgctctcg 3600
tgatcgaacc attcgcgcag cccggcgtag tccttgcggg actggttggc gcgagcgacg 3660
atctgtttgc cgaccggaac acgctcagga gagtaggact cgagcagacc cggtcctgca 3720
```

```
taccccttca cgacgaacgc gatcttccat gccaggttga acgcgtcctg catggacgtg 3780
ttcgagccca gcccgctgct cggcggatgc cggtgcaccg cgtcgccgcc gcagaacact 3840
cgaccggact ggtagtgctc agcccactgc cggttgacgt accagaagga cctcgacacg 3900
atctcgacgt ccaggtgcgg gtcgccgacg agggtccgga tctgttcgag gacaacgtcg 3960
tcggagacat ccggctcgcc gttcgccatg tcgaagcccc agccggcgat ccactggtcc 4020
cacggtcgga tcgcgcgcag cagacccatg ccgatctcac cgaaaccggc cttcgagttg 4080
acgatccagt gcaagatgct cggccgatga gcgacatatt tgctcaggtc cgcgttgaac 4140
aggatgtacg cggtaccggc gcgggcgagt tcaccttcga acggaagccc gatctgttcg 4200
gcgatcttcg atcgtgcgcc gtcgaaaccg agcaggaagc gggctcgctg ggtgaacacg 4260
gtgcccgagc ggacgtcgcg gaaccggacg gtcaccccgt cctcgtcctg ggcgtggtcg 4320
aggtattcgg tgttgaagct gatgaccgca ccacgttcgg cggcgttctt gatcagcacc 4380
ggctccatca ggggctgcgg aatgtcgagc atcgtgcagg ggcttccgga caggtagtcc 4440
ccgtagcgga tatcgcccgt accccaggtc tgcatccgga cgatctcctc gccggccagg 4500
ctcgtggtga acagcgtgtc gcccatctgg tcccacgggg tggcgtagtt gcgcgcctcg 4560
tcttcgacgc ccaggtcacg cagcacttcg acggcgcgct ggttggtgat gtgcgcgcgc 4620
ggcgagttcg ccacccaggg gaacatcgag acggcgtgaa cgcggatgcc gtagctggcc 4680
agggcaagcg ccgctgtgcc accggcgggg ccgaggccga cgatcacgac gtcggtgtcg 4740
taggaggtgc ggtcgtggtc actcatgtct gtcatcactt cacttgtcga ggacgcgcag 4800
ggatgctgcg gtgtccggaa ctgtccgagt cgaaaatgtt tcggtgtcag gcattttcgg 4860
tgtggaggtg gcctggtcgc gagtgagctg gctcgcagcg cccttgcgcc cccagccgcc 4920
gggcagcagg atcaccgaga cgatcgagat ggccgagacg atcagcaggt aggtcacgat 4980
cgagttgctg gtgttggtgg aggcgtacaa ggcggtcgcg atcgtcgggg cgaacgcgga 5040
gccggcgacc tgggagatgg tgtagccgat agagacaccg ctgtagcgca cgtccgcgtc 5100
gaagaccatc gtgaacaggg agcctgtcac gccggcggcg ggggccattg caattccgaa 5160
gaccagcacc tgcgcggcca tgaacagcca cgggttgccg gtgttgatca gtgcgaaggc 5220
ggggccgatc accacaccca tcgcggcggc gccgagcagg tacatggtct tgcggccgaa 5280
agtgtcggac agagcgccga acacgaggta gaggaggacg gcgacgatgc cggcgacgaa 5340
tactccggcc agggcgaagg tgcggctgat ccccgcgacg gtggtgccgt aggagacgag 5400
gtaggccatg cagatatagg cgaacactcc ttgggacagg taggtgcccg cgatgaggag 5460
aatttccttc cagtgcttgc ggaacgcttc ggcgatcggc attcgcacca cggcgctctg 5520
tgccttcacc tcggcgaagt cggggctttc ggccagggac aggcgaatga acagcccgat 5580
cacgatcagc accgcgctga acaggaacgg cagtcgccag ccccaactca ggaactgctc 5640
gtcgggcaat tgggagaccg cgaagaacgc cagggttgcg acgctggtcc cggcgggtgc 5700
ccccatctgg gagaaggatc cgaaaaagcc cttcttcgcg gtgggggcgt gctcgacggc 5760
catcagggtg gctccacccc actcgccgcc gacggcaaag ccctgcacca ggcgcagcag 5820
ggtcagcagg atgggggcgg cgatcccgat ttgggcgtaa ccgggcaaca atcccatcag 5880
tacggtggcc gagcccattc cgaccaggga gatcaccagc atctgcttgc ggccgacccg 5940
gtcaccgaag tgcccgaaca ctatgccacc cagcgggcgg gcgaggaacc caacgctgaa 6000
ggtcgcgaac gacaacagga ttccgatcgc ggacgagaca tccgggaaga acaactcagg 6060
gaataccagc gcggccgcgg tgccgtagat gaagaagtcg tagtactcga cggtggtacc 6120
gatgaagctg gccatcgcta cccgcagcgg tgaggtcttc gtcggggagg taggtgtggt 6180
gctcacggtc gggcttcccc gatctgtggg cggaagtggg ctcgtgcccc gaaggacgat 6240
gcgtgcgaag cggtcgtcat ggccgctcct ttcttctggg gatgttcgag aggggttctc 6300
tggagaatct tcgagaggga gcactcaact agaatgctag acgtctagtt cagacgctac 6360
tcgggcatag agggtgacgc aagtctctgg atgagggtaa aggtgatcga cggcgcgccg 6420
gccctctagg gcgagacagg ggtcagcgtg gagggtgccg gtggatcgtc tgcagcgcta 6480
cggccgagag tcccccctcg gcgtaggtgg cgcgatagcg gagccggtcg atggcccggg 6540
tatcggggtc tagctcggca gctgggcgtt ggattcgtcg cggattactg cgatggtgcc 6600
gacgatgtgg cgttccatgg cctcgcgggc ggcagctgcg tcacggttgc ggatggcctc 6660
ggtgatttcg tggtggtcat gctgccggtc gggcagtgcg ctcgagagcg ggttggtgat 6720
gccggtggtg ttgatcaaga agtccgacag atcccacatt cgctggctgg tctcctccat 6780
gatccgcgag tgcgccatcg cgtggatggc cgcatggaac tcccggttgt gcacgcggta 6840
cccgcgggcg cggaccaccg ggtcgtggga ggtgatcagg cgtcgaccc gcgccgagat 6900
caggtccagc tccagcaact gggcctcggt ccgcgggag gccgctaccg cggcgatggt 6960
cccttcgaaa ccgccgaaca gggtgtagaa gtcttccact tcgcgcgggg cgtaggagac 7020
gacctcgcaa ccgacctggg gaacgatgtg gaccagcttg tcgctggaca ggcggcgcag 7080
agcgtccatg acgggctgct tgctcacccc gaactcttgc cggatcgact cgacgacgat 7140
```

```
cttctcgcct gccgcatagc gcccttcgag cagccggttc ttcagaatgt cgtacaacgc 7200
ggaggacagc cgcgcccccg aggtgcggac attggcgagc agggcggcgg cctcactgcc 7260
cggcttgggg ccggtgtcgg tggtggtcat cgagtcaggc tttccgtcgg cgtcccggac 7320
atggctcccc cttatgccgc ggcgctcacc gcaacagctt gcattctagt acttgtggtg 7380
tgagtcactg tgggttacct tcgtctggaa cgctagcatt ccagacctga tggccggggc 7440
atcgtggcca acctcggggt taacgccgga gggcacgccg tacgcgccat atccaggcac 7500
ccggacatgc ccctctgcg ggcgacaggc cgagcagtgc cctcggcaac gcgggccaca 7560
tgcaaggaga agaacatgga attc                                         7584
```

<210> 3
<211> 246
<212> PRT
<213> Rhodococcus corallina

<400> 3

```
Met Thr Thr Thr Asp Thr Gly Pro Lys Pro Gly Ser Glu Ala Ala Ala
 1               5               10               15

Leu Leu Ala Asn Val Arg Thr Ser Gly Ala Arg Leu Ser Ser Ala Leu
            20               25               30

Tyr Asp Ile Leu Lys Asn Arg Leu Leu Glu Gly Arg Tyr Ala Ala Gly
         35               40               45

Glu Lys Ile Val Val Glu Ser Ile Arg Gln Glu Phe Gly Val Ser Lys
      50               55               60

Gln Pro Val Met Asp Ala Leu Arg Arg Leu Ser Ser Asp Lys Leu Val
   65               70               75               80

His Ile Val Pro Gln Val Gly Cys Glu Val Val Ser Tyr Ala Pro Arg
               85               90               95

Glu Val Glu Asp Phe Tyr Thr Leu Phe Gly Gly Phe Glu Gly Thr Ile
            100              105              110

Ala Ala Val Ala Ala Ser Arg Arg Thr Glu Ala Gln Leu Leu Glu Leu
            115              120              125

Asp Leu Ile Ser Ala Arg Val Asp Ala Leu Ile Thr Ser His Asp Pro
   130              135              140

Val Val Arg Ala Arg Gly Tyr Arg Val His Asn Arg Glu Phe His Ala
145              150              155              160

Ala Ile His Ala Met Ala His Ser Arg Ile Met Glu Glu Thr Ser Gln
            165              170              175

Arg Met Trp Asp Leu Ser Asp Phe Leu Ile Asn Thr Thr Gly Ile Thr
            180              185              190

Asn Pro Leu Ser Ser Ala Leu Pro Asp Arg Gln His Asp His His Glu
            195              200              205

Ile Thr Glu Ala Ile Arg Asn Arg Asp Ala Ala Ala Ala Arg Glu Ala
   210              215              220
```

```
Met Glu Arg His Ile Val Gly Thr Ile Ala Val Ile Arg Asp Glu Ser
225             230             235             240

Asn Ala Gln Leu Pro Ser
                245


<210> 4
<211> 451
<212> PRT
<213> Rhodococcus corallina

<400> 4
Met Ala Ser Phe Ile Gly Thr Thr Val Glu Tyr Tyr Asp Phe Phe Ile
  1             5               10              15

Tyr Gly Thr Ala Ala Ala Leu Val Phe Pro Glu Leu Phe Phe Pro Asp
                20              25              30

Val Ser Ser Ala Ile Gly Ile Leu Leu Ser Phe Ala Thr Phe Ser Val
            35              40              45

Gly Phe Leu Ala Arg Pro Leu Gly Gly Ile Val Phe Gly His Phe Gly
        50              55              60

Asp Arg Val Gly Arg Lys Gln Met Leu Val Ile Ser Leu Val Gly Met
 65             70              75              80

Gly Ser Ala Thr Val Leu Met Gly Leu Leu Pro Gly Tyr Ala Gln Ile
            85              90              95

Gly Ile Ala Ala Pro Ile Leu Leu Thr Leu Leu Arg Leu Val Gln Gly
            100             105             110

Phe Ala Val Gly Gly Glu Trp Gly Gly Ala Thr Leu Met Ala Val Glu
        115             120             125

His Ala Pro Thr Ala Lys Lys Gly Phe Phe Gly Ser Phe Ser Gln Met
        130             135             140

Gly Ala Pro Ala Gly Thr Ser Val Ala Thr Leu Ala Phe Phe Ala Val
145             150             155             160

Ser Gln Leu Pro Asp Glu Gln Phe Leu Ser Trp Gly Trp Arg Leu Pro
                165             170             175

Phe Leu Phe Ser Ala Val Leu Ile Val Ile Gly Leu Phe Ile Arg Leu
            180             185             190

Ser Leu Ala Glu Ser Pro Asp Phe Ala Glu Val Lys Ala Gln Ser Ala
        195             200             205

Val Val Arg Met Pro Ile Ala Glu Ala Phe Arg Lys His Trp Lys Glu
        210             215             220

Ile Leu Leu Ile Ala Gly Thr Tyr Leu Ser Gln Gly Val Phe Ala Tyr
225             230             235             240
```

```
Ile Cys Met Ala Tyr Leu Val Ser Tyr Gly Thr Thr Val Ala Gly Ile
            245             250             255

Ser Arg Thr Phe Ala Leu Ala Gly Val Phe Val Ala Gly Ile Val Ala
            260             265             270

Val Leu Leu Tyr Leu Val Phe Gly Ala Leu Ser Asp Thr Phe Gly Arg
            275             280             285

Lys Thr Met Tyr Leu Leu Gly Ala Ala Ala Met Gly Val Val Ile Ala
            290             295             300

Pro Ala Phe Ala Leu Ile Asn Thr Gly Asn Pro Trp Leu Phe Met Ala
305             310             315             320

Ala Gln Val Leu Val Phe Gly Ile Ala Met Ala Pro Ala Ala Gly Val
            325             330             335

Thr Gly Ser Leu Phe Thr Met Val Phe Asp Ala Asp Val Arg Tyr Ser
            340             345             350

Gly Val Ser Ile Gly Tyr Thr Ile Ser Gln Val Ala Gly Ser Ala Phe
            355             360             365

Ala Pro Thr Ile Ala Thr Ala Leu Tyr Ala Ser Thr Asn Thr Ser Asn
370             375             380

Ser Ile Val Thr Tyr Leu Leu Ile Val Ser Ala Ile Ser Ile Val Ser
385             390             395             400

Val Ile Leu Leu Pro Gly Gly Trp Gly Arg Lys Gly Ala Ala Ser Gln
            405             410             415

Leu Thr Arg Asp Gln Ala Thr Ser Thr Pro Lys Met Pro Asp Thr Glu
            420             425             430

Thr Phe Ser Thr Arg Thr Val Pro Asp Thr Ala Ala Ser Leu Arg Val
            435             440             445

Leu Asp Lys
    450


<210> 5
<211> 636
<212> PRT
<213> Rhodococcus corallina

<400> 5
Met Thr Asp Met Ser Asp His Asp Arg Thr Ser Tyr Asp Thr Asp Val
    1               5               10              15

Val Ile Val Gly Leu Gly Pro Ala Gly Gly Thr Ala Ala Leu Ala Leu
            20              25              30

Ala Ser Tyr Gly Ile Arg Val His Ala Val Ser Met Phe Pro Trp Val
            35              40              45
```

Ala Asn Ser Pro Arg Ala His Ile Thr Asn Gln Arg Ala Val Glu Val
    50   55   60

Leu Arg Asp Leu Gly Val Glu Asp Glu Ala Arg Asn Tyr Ala Thr Pro
 65   70   75   80

Trp Asp Gln Met Gly Asp Thr Leu Phe Thr Thr Ser Leu Ala Gly Glu
          85   90   95

Glu Ile Val Arg Met Gln Thr Trp Gly Thr Gly Asp Ile Arg Tyr Gly
        100   105   110

Asp Tyr Leu Ser Gly Ser Pro Cys Thr Met Leu Asp Ile Pro Gln Pro
    115   120   125

Leu Met Glu Pro Val Leu Ile Lys Asn Ala Ala Glu Arg Gly Ala Val
    130   135   140

Ile Ser Phe Asn Thr Glu Tyr Leu Asp His Ala Gln Asp Glu Asp Gly
145   150   155   160

Val Thr Val Arg Phe Arg Asp Val Arg Ser Gly Thr Val Phe Thr Gln
        165   170   175

Arg Ala Arg Phe Leu Leu Gly Phe Asp Gly Ala Arg Ser Lys Ile Ala
        180   185   190

Glu Gln Ile Gly Leu Pro Phe Glu Gly Glu Leu Ala Arg Ala Gly Thr
        195   200   205

Ala Tyr Ile Leu Phe Asn Ala Asp Leu Ser Lys Tyr Val Ala His Arg
    210   215   220

Pro Ser Ile Leu His Trp Ile Val Asn Ser Lys Ala Gly Phe Gly Glu
225   230   235   240

Ile Gly Met Gly Leu Leu Arg Ala Ile Arg Pro Trp Asp Gln Trp Ile
        245   250   255

Ala Gly Trp Gly Phe Asp Met Ala Asn Gly Glu Pro Asp Val Ser Asp
        260   265   270

Asp Val Val Leu Glu Gln Ile Arg Thr Leu Val Gly Asp Pro His Leu
        275   280   285

Asp Val Glu Ile Val Ser Arg Ser Phe Trp Tyr Val Asn Arg Gln Trp
    290   295   300

Ala Glu His Tyr Gln Ser Gly Arg Val Phe Cys Gly Gly Asp Ala Val
305   310   315   320

His Arg His Pro Pro Ser Ser Gly Leu Gly Ser Asn Thr Ser Met Gln
        325   330   335

Asp Ala Phe Asn Leu Ala Trp Lys Ile Ala Phe Val Val Lys Gly Tyr
        340   345   350

Ala Gly Pro Gly Leu Leu Glu Ser Tyr Ser Pro Glu Arg Val Pro Val
        355   360   365

Gly Lys Gln Ile Val Ala Arg Ala Asn Gln Ser Arg Lys Asp Tyr Ala
        370   375   380

Gly Leu Arg Glu Trp Phe Asp His Glu Ser Asp Asp Pro Val Ala Ala
385   390   395   400

Gly Leu Ala Lys Leu Lys Glu Pro Ser Ser Glu Gly Val Ala Leu Arg
            405   410   415

Glu Arg Leu Tyr Glu Ala Leu Glu Val Lys Asn Ala Glu Phe Asn Ala
            420   425   430

Gln Gly Val Glu Leu Asn Gln Arg Tyr Thr Ser Ser Ala Val Val Pro
        435   440   445

Asp Pro Glu Ala Gly Glu Glu Val Trp Val Arg Asp Arg Glu Leu Tyr
    450   455   460

Leu Gln Ala Thr Thr Arg Pro Gly Ala Lys Leu Pro His Ala Trp Leu
465   470   475   480

Val Gly Ala Asp Gly Thr Arg Ile Ser Thr Leu Asp Val Thr Gly Lys
            485   490   495

Gly Met Met Thr Leu Leu Thr Gly Leu Gly Gly Gln Ala Trp Lys Arg
            500   505   510

Ala Ala Ala Lys Leu Asp Leu Pro Phe Leu Arg Thr Val Val Val Gly
        515   520   525

Glu Pro Gly Thr Ile Asp Pro Tyr Gly Tyr Trp Arg Arg Val Arg Asp
    530   535   540

Ile Asp Glu Ala Gly Ala Leu Leu Val Arg Pro Asp Gly Tyr Val Ala
545   550   555   560

Trp Arg His Ser Ala Pro Val Trp Asp Asp Thr Glu Ala Leu Thr Ser
            565   570   575

Leu Glu Asn Ala Leu Thr Ala Val Leu Asp His Ser Ala Ser Asp Asn
            580   585   590

Gly Asn Pro Ser Gly Thr Asn Glu Pro Gln Tyr Ser Thr Arg Ala Val
        595   600   605

Pro Ile Val Val Pro His Val Thr Ala Glu Asp Ala Ala Pro Ala Ser
    610   615   620

Ala Thr Arg Thr Thr Thr Val Glu Gly Glu Asn Arg
625   630   635

<210> 6
<211> 289
<212> PRT
<213> Rhodococcus corallina

<400> 6

```
Met Thr Arg Pro Tyr Thr Ser Val Trp Asp Asp Leu Asn Gln Val Glu
 1               5                  10                  15

Phe Ser Gln Gly Phe Ile Gln Ala Gly Pro Tyr Arg Thr Arg Tyr Leu
            20                  25                  30

His Ala Gly Asp Ser Ser Lys Pro Thr Leu Ile Leu Leu His Gly Ile
            35                  40                  45

Thr Gly His Ala Glu Ala Tyr Val Arg Asn Leu Arg Ser His Ser Glu
        50                  55                  60

His Phe Asn Val Trp Ala Ile Asp Phe Ile Gly His Gly Tyr Ser Thr
65              70                  75                  80

Lys Pro Asp His Pro Leu Glu Ile Lys His Tyr Ile Asp His Val Leu
                85                  90                  95

Gln Leu Leu Asp Ala Ile Gly Val Glu Lys Ala Ser Phe Ser Gly Glu
            100                 105                 110

Ser Leu Gly Gly Trp Val Thr Ala Gln Phe Ala His Asp His Pro Glu
        115                 120                 125

Lys Val Asp Arg Ile Val Leu Asn Thr Met Gly Gly Thr Met Ala Asn
    130                 135                 140

Pro Gln Val Met Glu Arg Leu Tyr Thr Leu Ser Met Glu Ala Ala Lys
145                 150                 155                 160

Asp Pro Ser Trp Glu Arg Val Lys Ala Arg Leu Glu Trp Leu Met Ala
            165                 170                 175

Asp Pro Thr Met Val Thr Asp Asp Leu Ile Arg Thr Arg Gln Ala Ile
            180                 185                 190

Phe Gln Gln Pro Asp Trp Leu Lys Ala Cys Glu Met Asn Met Ala Leu
        195                 200                 205

Gln Asp Leu Glu Thr Arg Lys Arg Asn Met Ile Thr Asp Ala Thr Leu
    210                 215                 220

Asn Gly Ile Thr Val Pro Ala Met Val Leu Trp Thr Thr Lys Asp Pro
225                 230                 235                 240

Ser Gly Pro Val Asp Glu Ala Lys Arg Ile Ala Ser His Ile Pro Gly
            245                 250                 255

Ala Lys Leu Ala Ile Met Glu Asn Cys Gly His Trp Pro Gln Tyr Glu
        260                 265                 270
```

```
Asp Pro Glu Thr Phe Asn Lys Leu His Leu Asp Phe Leu Leu Gly Arg
        275             280             285

Ser
```

<210> 7
<211> 314
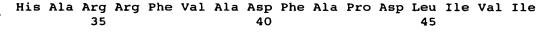<212> PRT
<213> Rhodococcus corallina

<400> 7

```
Met Pro Val Ala Leu Cys Ala Met Ser His Ser Pro Leu Met Gly Arg
 1           5               10              15

Asn Asp Pro Glu Gln Glu Val Ile Asp Ala Val Asp Ala Ala Phe Asp
            20              25              30

His Ala Arg Arg Phe Val Ala Asp Phe Ala Pro Asp Leu Ile Val Ile
        35              40              45

Phe Ala Pro Asp His Tyr Asn Gly Val Phe Tyr Asp Leu Leu Pro Pro
        50              55              60

Phe Cys Ile Gly Ala Ala Ala Gln Ser Val Gly Asp Tyr Gly Thr Glu
 65              70              75              80

Ala Gly Pro Leu Asp Val Asp Arg Asp Ala Ala Tyr Ala Val Ala Arg
            85              90              95

Asp Val Leu Asp Ser Gly Ile Asp Val Ala Phe Ser Glu Arg Met His
            100             105             110

Val Asp His Gly Phe Ala Gln Ala Leu Gln Leu Leu Val Gly Ser Ile
        115             120             125

Thr Ala Val Pro Thr Val Pro Ile Phe Ile Asn Ser Val Ala Glu Pro
    130             135             140

Leu Gly Pro Val Ser Arg Val Arg Leu Leu Gly Glu Ala Val Gly Arg
145             150             155             160

Ala Ala Ala Lys Leu Asp Lys Arg Val Leu Phe Val Gly Ser Gly Gly
            165             170             175

Leu Ser His Asp Pro Pro Val Pro Gln Phe Ala Thr Ala Pro Glu Glu
            180             185             190

Val Arg Glu Arg Leu Ile Asp Gly Arg Asn Pro Ser Ala Ala Glu Arg
        195             200             205

Asp Ala Arg Glu Gln Arg Val Ile Thr Ala Gly Arg Asp Phe Ala Ala
    210             215             220

Gly Thr Ala Ala Ile Gln Pro Leu Asn Pro Glu Trp Asp Arg His Leu
225             230             235             240
```

```
Leu Asp Val Leu Ala Ser Gly Asp Leu Glu Gln Ile Asp Ala Trp Thr
            245             250             255

Asn Asp Trp Phe Val Glu Gln Ala Gly His Ser Ser His Glu Val Arg
            260             265             270

Thr Trp Ile Ala Ala Tyr Ala Ala Met Ser Ala Ala Gly Lys Tyr Arg
            275             280             285

Val Thr Ser Thr Phe Tyr Arg Glu Ile His Glu Trp Ile Ala Gly Phe
            290             295             300

Gly Ile Thr Thr Ala Val Ala Val Asp Glu
305             310
```

<210> 8
<211> 289
<212> PRT
<213> Rhodococcus corallina

<400> 8
```
Met Thr Ser Val Arg Pro Cys Ser Pro Ser Val Asn Ala Gly Trp Ser
  1               5              10              15

Val Gly Arg Lys Thr Ser Ser Pro Thr Ser Pro Ser Thr Ser Gln Leu
            20              25              30

Val Ser Arg Asn Ala His Gly Pro Thr Ser Arg Ala Gly His Arg Gly
            35              40              45

Gln Pro Arg His Arg Gly Gly His Arg Arg Cys Gly Gly Arg Leu Arg
            50              55              60

Cys Arg Arg Asn Arg Pro Leu Arg Ile Arg Ser Asp Gly Arg Arg Cys
 65              70              75              80

Gly Val Asp Gly Ile Thr Ala Ala Gly Gly Leu Ala Ala Ala Val Gln
            85              90              95

Ala Asp Leu Ser Arg Pro Glu Gly Pro Glu Glu Leu Met Arg Glu Phe
            100             105             110

Asp Ser Ala Leu Asp Gly Leu Gly Leu Asp Arg Gly Leu Asp Ile Leu
            115             120             125

Val Asn Asn Ala Gly Ile Ser Arg Arg Gly Ala Leu Glu Arg Val Thr
            130             135             140

Val Glu Asp Phe Asp Arg Leu Val Ala Leu Asn Gln Arg Ala Pro Phe
145             150             155             160

Phe Val Thr Arg His Ala Leu Pro Arg Met His Asp Gly Gly Arg Ile
            165             170             175

Val Asn Ile Ser Ser Gly Ser Ala Arg Tyr Ala Arg Pro Asp Val Ile
            180             185             190
```

Ser Tyr Ala Met Thr Lys Gly Ala Ile Glu Val Leu Thr Arg Ala Leu
        195   200   205

Ala Val Asp Val Gly Glu Arg Gly Ile Thr Ala Asn Ala Val Ala Pro
        210   215   220

Ala Ala Leu Asp Thr Asp Met Asn Ala His Trp Leu Arg Gly Asp Asp
225   230   235   240

His Ala Arg Thr Thr Ala Ala Ser Thr Thr Ala Leu Arg Lys Leu Ala
                245   250   255

Thr Ala Glu Asp Ile Ala Ala Ile Val Ala Phe Leu Val Ser Ala Ala
        260   265   270

Ala Gly Ala Ile Thr Gly Gln Val Ile Asp Ala Thr Asn Gly Asn Arg
        275   280   285

Leu

<210> 9
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 9
cgctgatttg tattgtctg   19

<210> 10
<211> 19
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 10
gacttccatt gttcattcc   19

<210> 11
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 11
aaaagacgtc ggtgcgaata agggacagtg   30

<210> 12
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Primer

<400> 12
aaaagacgtc acaaaacagc agggaagcag   30